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U.S. DEPARTMENT OF COMMERCE
PATENT AND TRADEMARK OFFICE

APPEAL BRIEF TRANSMITTAL &
EXTENSION-OF-TIME REQUEST

Docket Number:
10191/1730

Conf. No.
9715

Application Number
09/782,087

Filing Date
February 12, 2001

Examiner
Mark Osborne BUDD

Art Unit
2834

Invention Title
**A PIEZOELECTRIC CERAMIC BODY
HAVING SILVER-CONTAINING
INTERNAL ELECTRODES**

Inventor
Marianne HAMMER et al.

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Signature: [Signature]
Jong H. Lee

Further to the Notice of Appeal dated November 12, 2002 for the above-referenced application, enclosed are three copies of an Appeal Brief. Accompanying the Appeal Brief is the Appendix to the Appeal Brief. A one-month extension of time for filing the Appeal Brief is requested. The extended period expires on February 12, 2003.

The Commissioner is hereby authorized to charge payment of the 37 C.F.R. § 1.17(c) appeal brief filing fee of \$320.00, a one-month extension fee of \$110, and any additional fees associated with this communication to the deposit account of **Kenyon & Kenyon**, deposit account number **11-0600**.

Dated: 2/11, 2003

By: [Signature]
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36,197
P. No.



[10191/1730]

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES**

Applicants : Marianne HAMMER et al.
Serial No. : 09/782,087
Filing Date : February 12, 2001
For : A PIEZOELECTRIC CERAMIC BODY HAVING SILVER
CONTAINING INTERNAL ELECTRODES
Examiner : Mark Osborne BUDD
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Jong H. Lee

APPELLANTS' APPEAL BRIEF
UNDER 37 C.F.R. § 1.192

S I R :

Applicants filed a Notice of Appeal dated November 12, 2002, appealing from the Final Office Action dated July 11, 2002, in which claims 1-9 of the above-identified application were finally rejected and claim 10 objected to. This Brief is submitted by Applicants in support of their appeal.

I. REAL PARTY IN INTEREST

The above-identified Applicants and Robert Bosch GmbH of Stuttgart, Germany, are the real parties in interest.

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II. RELATED APPEALS AND INTERFERENCES

No appeal or interference which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending appeal is known to exist to the undersigned attorney or is believed by the undersigned attorney to be known to exist to Applicants.

III. STATUS OF CLAIMS

Claims 1-8 and 10 are pending in this application. Claim 9 has been canceled. Claims 1 and 10 have been amended. Of claims 1-8 presently on appeal, claim 1 is independent, and claims 2-8 ultimately depend from claim 1. The claims on appeal are set forth in the Appendix submitted herewith. Applicants note that claim 10, which remains objected to, is in allowable condition since the Examiner had previously indicated that claim 10 would be allowable if rewritten in independent form to include all the limitations of the base claim (claim 1) and any intervening claim (claim 9), and Applicants have amended claim 10 to include the limitations of claims 1 and 9.

IV. STATUS OF AMENDMENTS

A Rule 116 Amendment was filed on October 7, 2002 in response to the final Office Action dated July 11, 2002. In the Rule 116 Amendment, Applicants amended claims 1 and 10, and canceled claim 9. In the Advisory Action mailed on October 21, 2002, the Examiner indicated that the Amendment will be entered.

V. SUMMARY OF THE INVENTION

In accordance with the present invention, a piezoelectric ceramic with at least one silver-containing internal electrode has a component which reduces and/or inhibits a diffusion of silver from the internal electrode into a neighboring insulating layer. (P. 2, l. 20-22). Since the silver added to the internal-electrode material essentially remains in the electrode, the negative influencing of the properties of the piezoelectric ceramic material, e.g., a PZT ceramic, by the

diffusion of the silver is significantly reduced. (P. 2, l. 22-25).

As shown in the Figure, a piezoelectric ceramic body 5 has multiple sintered insulating layers 12 made of piezoactive PZT ceramic, which are separated from each other in areas by sintered internal electrodes 13 and 14 in the form of thin layers. (P. 4, l. 18-22). The PZT ceramic has the composition, for example, $\text{Pb}(\text{Ti}_x\text{Zr}_{1-x})\text{O}_3$, where $0.4 < x < 0.6$, and the thickness of insulating layer 12, for example, is 50 to 130 micrometers, given a typical number of 300 to 600, and the thickness of internal electrodes 13 and 14 is between 500 nm and five micrometers, preferably at 1 to 2 micrometers. (P. 4, l. 22-26).

The end faces of ceramic body 5 are also contacted by two external electrodes 10 and 11, opposite each other, first external electrode 10 contacting first internal electrodes 13, and second external electrode 11 contacting second internal electrodes 14. (P. 4, l. 28 - p. 5, l. 2). Via external electrodes 10 and 11, internal electrodes 13 and 14 can be acted upon by a field intensity, which is typically between 1 kV/mm and 3 kV/mm, and in ceramic body 5, as a result of the inverse piezoelectric effect, an expansion or compression of insulating layers 12 results in the direction of the surface normals of insulating layers 12. (P. 5, l. 2-6). Therefore, internal electrodes 13 and 14 form the plates of a plate-type capacitor, having insulating layers 12 as the dielectric. (P. 5, l. 6-7).

The internal electrodes 13 and 14 may be made of a silver-palladium alloy and a piezoelectric ceramic component, e.g., a PZT ceramic, which preferably has the same composition as that of adjacent insulating layers 12. (P. 5, l. 29 - p. 6, l. 2). Overall, the proportion of the piezoelectric ceramic component in internal electrodes 13 and 14 amounts to a maximum of 50 percent by volume, with respect to the entire volume of the material of internal electrodes 13 and 14. (P. 6, l. 2-5). The proportion of PZT ceramic in internal electrodes 13 and 14 amounts to between 10 percent by volume and 30 percent by volume. (P. 6, l. 5-6). Regarding the silver-palladium alloy, it is expedient to use an alloy whose palladium content

is as low as possible, e.g., alloys having a proportion of less than 30 percent by mass palladium, preferably less than 20 percent by mass. (P. 6, l. 6-9).

As the material for insulating layers 12 and as the piezoelectric ceramic component in internal electrodes 13, 14, the preferred choice is a PZT ceramic (lead-zirconate-titanate ceramic), to which dopant is also added at an order of magnitude of 2 mol% to 8 mol%. (P. 6, l. 11-14). Examples of dopants are rare-earth metals such as lanthanum or neodymium, subgroup elements such as niobium, tantalum, iron, or nickel, alkali metals such as sodium, potassium, or lithium, or alkaline-earth elements such as strontium. (P. 6, l. 14-17). Internal electrodes 14 and 15 are made of an electrically conductive AgPd alloy in a mass ratio 85:15, and added to this AgPd alloy is a ceramic PZT material in the proportion of 20 percent by volume, which has had added to it as dopant 2 mol% $\text{Sr}(\text{K}_{0.25}\text{Nb}_{0.75})\text{O}_3$. (P. 6, l. 19-22).

VI. ISSUES FOR REVIEW

The following issues are presented for review on appeal in this case:

A) Whether the subject matter of claims 1, 2 and 4-6 is anticipated under 35 U.S.C. § 102(b) by U.S. Patent 5,196,757 ("Omatsu").

B) Whether the subject matter of claim 3 is unpatentable under 35 U.S.C. § 103(a) over U.S. Patent 5,196,757 ("Omatsu").

C) Whether the subject matter of claims 7 and 8 is anticipated under 35 U.S.C. § 102(b) by U.S. Patent 4,845,399 ("Yasuda et al.").

VII. GROUPING OF CLAIMS

For purposes of this appeal, claims 1, 2 and 4-6 will be argued as one group; claim 3 will be argued as another group; and claims 7 and 8 will be argued as another group. Applicants reserve the right to present additional arguments in support of patentability of the dependent claims.

VIII. ARGUMENTS

A. Rejection of Claims 1, 2 and 4-6

Claims 1, 2, and 4-6 stand rejected under 35 U.S.C. § 102(b) as being anticipated by Omatsu. It is respectfully submitted that the pending claims are not anticipated by Omatsu for at least the following reasons.

To anticipate a claim under § 102, a single prior art reference must identically disclose each and every claim element. See Lindeman Maschinenfabrik v. American Hoist and Derrick, 730 F.2d 1452, 1458 (Fed. Cir. 1984). If any claimed element is absent from a prior art reference, it cannot anticipate the claim. See Rowe v. Dror, 112 F.3d 473, 478 (Fed. Cir. 1997). Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claim invention, *arranged as in the claim*. Lindeman, 703 F.2d 1458 (Emphasis added).

As amended, Claim 1 recites that "the internal electrodes include a PZT ceramic modified by at least one of: rare-earth metals, subgroup elements, alkali metals and alkaline-earth metals." Omatsu merely indicates that "the internal electrode 2 is formed of a mixture which is obtained by mixing the same piezoelectric ceramic powder as that of the ceramic layer 1 [PZT] into a silver-palladium powder mixture." (Omatsu, col. 4, l. 12-15). However, nothing in Omatsu teaches **internal electrodes which include a PZT ceramic modified by at least one of: rare-earth metals, subgroup elements, alkali metals and alkaline-earth metals**. In fact, the Examiner implicitly acknowledged that this feature is not taught by Omatsu or any other cited prior art reference: this feature of claim 1 is also found in claim 10, which the Examiner indicated as containing allowable subject matter.

For at least the foregoing reasons, Applicants respectfully submit that Omatsu does not anticipate claim 1 or its dependent claims 2 and 4-6. Reversal of this rejection is respectfully requested.

B. Rejection of Claim 3

Claim 3 stands rejected under 35 U.S.C. § 103(a) as being obvious over Omatsu. Applicants respectfully submit that this rejection should be reversed for at least the following reasons.

In order for a claim to be rejected for obviousness under 35 U.S.C. § 103(a), not only must the prior art teach or suggest each element of the claim, but the prior art must also suggest combining the elements in the manner contemplated by the claim. See Northern Telecom, Inc. v. Datapoint Corp., 908 F.2d 931, 934 (Fed. Cir. 1990), cert. denied, 111 S. Ct. 296 (1990); In re Bond, 910 F.2d 831, 834 (Fed. Cir. 1990). The Examiner bears the initial burden of establishing a *prima facie* case of obviousness. See M.P.E.P. § 2142. To establish a *prima facie* case of obviousness, the Examiner must show, *inter alia*, that there is some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify or combine the references and that, when so modified or combined, the prior art teaches or suggests all of the claim limitations. See M.P.E.P. § 2143. Applicants respectfully submit that these criteria for obviousness are not met here.

Initially, Applicants note that claim 3 ultimately depends on claim 1, and that Omatsu does not teach internal electrodes composed of a PZT ceramic modified by at least one of: rare-earth metals, subgroup elements, alkali metals and alkaline-earth metals, as recited in amended claim 1. Accordingly, claim 3 is not rendered obvious for at least the reasons given for allowability of claim 1.

Independent of the above, Applicants note that the Examiner's assertions regarding the limitations of claim 3 are unsupported. Although the Examiner notes that Omatsu does not disclose the exact composition of the PZT as recited in claim 3, the Examiner has taken Official Notice that the mechanical and electrical characteristics of different PZT compositions are "well known" in the related art. Initially, Applicants note that the Examiner is not addressing the

entirety of the limitations recited in claim 3: whether it is "well-known" to have various mechanical and electrical characteristics of different PZT compositions is not the issue; rather, the relevant issue is whether it is "well-known" to provide a PZT having the composition that includes PB ($\text{Ti}_x\text{Zr}_{1-x}\text{O}_3$, where $0.40 < x < 0.60$). Applicants respectfully submit that this claimed feature is not well known in the prior art, and the obviousness conclusion with respect to claim 3 is unwarranted. To the extent the Examiner intends to maintain this Official Notice, Applicants respectfully submit that documentary support for the Examiner's assertion should be provided in accordance with MPEP 2144.03.

C. Claims 7 and 8 are not anticipated by Yasuda et al.

Claims 7 and 8 stand rejected under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent 4,845,399 ("Yasuda et al.").¹ In support of the rejection, the Examiner notes that "[t]he reference discloses in fig. 1 a laminated piezoelectric structure and inner electrodes with silver and Fe or Ni of less than [8]%Mol." It is respectfully submitted that the pending claims are not anticipated by Yasuda et al. for at least the following reasons.

To anticipate a claim under § 102, a single prior art reference must identically disclose each and every claim element. See Lindeman Maschinenfabrik v. American Hoist and Derrick, 730 F.2d 1452, 1458 (Fed. Cir. 1984). If any claimed element is absent from a prior art reference, it cannot anticipate the claim. See Rowe v. Dror, 112 F.3d 473, 478 (Fed. Cir. 1997). Anticipation requires the presence in a single prior art reference disclosure of each and every element of the claim invention, arranged as in the claim. Lindeman, 703 F.2d 1458 (Emphasis added).

¹ The Examiner stated in the Final Office Action that "[c]laims 6 and 7 are rejected" based on Yasuda et al., but the actual discussion of the rejection refers to elements of claims 7 and 8.

Even if Yasuda et al. reference did teach "a laminated piezoelectric structure and inner electrodes with silver and Fe or Ni of less than [8]%Mol," Yasuda et al. reference clearly fails to teach **internal electrodes which include a PZT ceramic modified by at least one of rare-earth metals, subgroup elements, alkali metals and alkaline-earth metals**, as recited in amended claim 1, from which claims 7 and 8 ultimately depend. Yasuda et al. reference states that the internal electrodes 2 are formed of two kinds of metal paste, in two patterns 11 and 12: "pattern 11 is made of a silver paste containing palladium (or Fe, Co, Ni, Ru, Os, Ir, Pt or the like) mixed therein in an amount of 5 to 35% by weight," and "pattern 12 is made of a silver paste containing lead (or Sb, Sn, Zn or the like) mixed therein [in] an amount of 5 to 30% by weight." (Yasuda et al., col. 3, l. 47-53). Nothing in Yasuda et al. reference indicates that the internal electrodes 2 further include a PZT ceramic, let alone **PZT ceramic modified by at least one of rare-earth metals, subgroup elements, alkali metals and alkaline-earth metals**. For at least this reason, claims 7 and 8, which ultimately depend from amended claim 1, are not anticipated by Yasuda et al. reference. Therefore, withdrawal of this rejection is respectfully requested.

IX. CONCLUSION

For the foregoing reasons, it is respectfully submitted that the final rejection of claims 1-8 should be reversed.

Respectfully submitted,

KENYON & KENYON

Dated: 2/4, 2003

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